



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No. RPRO-014/2559

Approved date : 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 1 of 1

Addendum

The addendum is made to be a part of Specification No.: RPRO-014/2559 : REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

For bids with bid closing date before **31st March 2017**, PEA will also accept type test certificates or type test reports of the voltage transformer specified in clause **1d.1 Type tests and test report** after signing the contract. In this case the bidders have to submit testing plan including information such as test procedure, laboratory and test date to PEA for consideration instead with the bid or within fifteen (15) calendar days after the bid closing date.

The type test certificates or type test reports of the voltage transformer shall be submitted to PEA's acceptance committee for approval before shipment.



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 1 of 21

Invitation to Bid No.:

C Material, equipment, and specifications for REMOTE CONTROLLED SWITCHES FOR 22 kV and 33 kV 50 Hz DISTRIBUTION SYSTEM

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover remote controlled switches, suitable for outdoor installation in 22 kV and 33 kV 50 Hz distribution systems.

1b Standards

The remote controlled switches and accessories shall be manufactured and tested in accordance with the following standards:

International Electrotechnical Commission (IEC)

IEC 60265-1: 1998 High-voltage switches – Part 1: Switches for rated voltages above 1 kV and less than 52 kV

IEC 61869-2: 2012 Instrument transformers – Part 2: Additional requirements for current transformers

IEC 61869-3: 2011 Instrument transformers – Part 3: Additional requirements for inductive voltage transformers

And all other relevant standards, unless otherwise specified in these specification.

PEA will also accept the remote controlled switches and accessories tested in accordance with the later edition of the above standards.

1c Principal requirement

1c.1 General

The remote controlled switches (hereinafter called the RCS) and accessories shall be designed and constructed for mounting on concrete pole, as shown in **Drawing No. SA4-015/45003**.

Each set of the RCS shall have of the following equipment:

- (1) Three-phase SF₆ gas load break switches (hereinafter called the switches)
- (2) Current sensors
- (3) Voltage transformer
- (4) Control unit
- (5) Crossarm, and
- (6) Accessories



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 2 of 21

1c.2 Site and service conditions

The RCS shall be suitable for operation under the following conditions:

Ambient air temperature	: up to 50 ⁰ C
Relative humidity	: up to 94%
Altitude	: up to 1,000 m above mean sea level
Climatic condition	: tropical climate

1c.3 The switches

The switches (see typical design as shown in **Drawing No. SA4-015/49001**) shall have closed-position mechanical-latch to prevent the switch contacts from opening through loss of line voltage.

The switches shall be operated both manually without power supply by using a NEMA-head hook stick, and electrically by using operating mechanism and control unit.

The switches shall be puffer type, or combination of rotary arc and puffer arc quenching principle.

Under no circumstances, leakage currents shall pass from any pole terminal of the switches of one side to any pole terminal of the other side when in off-position.

The time to open the switches at rated normal current shall not be more than two (2) seconds.

The time to close the switches shall not be more than five (5) seconds. The opening and closing times shall be measured as follows:

- (1) Timing shall start when the switches open or close action is initiated at the local control panel of the switches, and
- (2) Timing shall end when the switches position indicator changes state.

The enclosure of the switches shall be made of stainless steel of type 304L and shall be dust-tight and waterproof. Gasket and bolted sealed shall not be used on pressurized tanks. However bushings may be sealed by using "O" rings. Any formation of condensation water shall be prevented.

The enclosure shall have a standard protection against corrosion. The finishing coat shall be grey (RAL 7032).

The switches shall have ratings and characteristics as specified in **Table 1**.

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM
Specification No.: RPRO-014/2559
Approved date: 02/08/2559
Rev. No.: 2
Form No. 08-5.1
Page 3 of 21
Table 1
Ratings and characteristics of the three-phase SF₆ gas load break switches

Ratings and characteristics	unit	Requirement	
		22	33
Rated nominal system voltage	kV	22	33
Rated frequency	Hz	50	
Rated normal current	A	not less than 600	not less than 400
Rated symmetrical interrupting current	A	not less than 600	not less than 400
Rated short-time withstand current, 1 second	kA (r.m.s)	not less than 12.5	not less than 10
Rated short-circuit making current	kA (peak)	not less than 31.25	not less than 25
Rated power frequency withstand voltage, 1 minute	kV (r.m.s)	not less than 50	not less than 70
Rated impulse withstand voltage	kV (peak)	not less than 125	not less than 170
Weight of each set of the switches (with operating mechanism)	kg	not more than 250	not more than 300
Number of operation: - mechanical - electrical (rated normal current)		not less than	not less than
	-	2,000	2,000
	-	400	400
Minimum creepage distance of bushing or supporting insulator, from live part to ground	mm	600	900

Each set of the switches shall be provided with:

- (1) Manual operating handle, with operating hook(s) having inner diameter of not less than 26 mm, suitable for use with NEMA-head hook stick (7.2 meters long) from ground level.
- (2) Mechanical indicator, ON/OFF
- (3) Tripping device
- (4) Closing device
- (5) Auxiliary contacts for status indicators and signals
- (6) Six (6) main circuit leads, each 2.5 meter long, insulated copper conductor, with sets of cable-end water-seals and sets of compression type terminal connectors with a two (2) holes NEMA pad
- (7) One (1) bar-tap tee connector for each lead for connecting to aluminium conductor diameters range from 14.3 mm to 17.6 mm (sizes 120 mm² – 185 mm²), as shown in **Drawing No. SA4-015/49001**.
- (8) Control cable with outdoor-rate connectors for connecting between connectors on the switches and on the bottom of the control cabinet, each 10 meter long. The control cables shall be shielded from electromagnetic interference (EMI) and radio frequency interference. The connectors on both sides of the cable shall be MIL-C-5015 female connectors (receptacle).

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 4 of 21

- (9) Connector with protective metal cap suitable for connecting to the control cabinet via control cable. The connector shall be MIL-C-5015 male connector (plug).
- (10) Earth terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm²); complete with lockwasher of stainless steel or better.
- (11) Pressure releasing device operating in case pressure builds up higher than permissible design pressure, ONLY for the switches with dead tank type.
- (12) Safety locking device for switching prohibition (both manually and electrically) in case SF₆ gas pressure drops below permissible minimum pressure, with red indicator to be visible from ground level, ONLY for the switches with dead tank type.
- (13) Mechanical locking lever, having two (2) positions of “FREE” and “LOCK”. When the mechanical locking lever is in “LOCK” position, the switches shall not be closed manually and electrically (from local control panel and from remote location).
- (14) Bushings of porcelain or polymer material
- (15) Bird guard caps (bushing cover) on line terminals made of ultra-violet resistant and tracking resistant material, e.g. polypropylene, neoprene, etc; which is suitable for exposure to sunlight. If the main circuit leads of the switches are connected to the bushing connectors in fully-insulated style, it is not necessary to use bird guard caps.
- (16) Lifting lug(s)
- (17) Nameplate
- (18) Mounting bracket, made of galvanized steel, and hardware (i.e. bolt, nut, flat washer, spring lock washer of stainless steel or better), suitable for crossarm having section range of 100 mm x 100 mm.
- (19) Absorber to absorb moisture and de-composed SF₆
- (20) Others according to manufacturer’s design

1c.4 Current sensors

The current sensors shall be bushing current transformer type.

The current sensors shall be able to measure load and fault currents through the switches on each phase and supply current input to the Feeder Remote Terminal Unit (FRTU) (provided by PEA).

The output of the current sensors shall be either 5 A (0-5 A) or 1 A (0-1 A) at the rated normal current.

The current sensors shall have an accuracy of $\pm 3\%$ or better at the rated normal current and $\pm 10\%$ or better at twenty (20) times of the rated normal current.

The above accuracy shall be maintained while connected to the FRTU current input card and other equipment according to manufacturer’s design.

The current sensors shall be protected against open secondary circuit. For bidding purpose, bidders shall assume that FRTU current input card shall have the burden of 1.0 VA on the current sensors.

1c.5 Voltage transformer

The voltage transformer shall be able to measure line-line voltage at the switches terminals and supply voltage input to the FRTU (provided by PEA). The output line-neutral voltage of the voltage transformer shall be $110/\sqrt{3}$ V AC ($0-110/\sqrt{3}$ V AC) at the rated normal voltage and shall be used as a power supply for the control unit.

The voltage transformer shall be of three-phase inductive voltage transformers with YNyn0 (Wye-ground) connection, as shown **Drawing No. SB4-015/59001** and shall be permanently sealed with oil expansion systems (fully oil filled with air expansion in bushings).

The main insulation of voltage transformer shall be mineral oil and insulation paper. The voltage transformer using a plastic material such as a plastic bobbin as an insulation material on the primary side shall be not accepted.

A tank cover of the voltage transformer shall be bolt tightened to the tank with suitable gasket sealing. The gaskets shall be seated properly to avoid over compressed. The gaskets used with the voltage transformer shall be hot oil-proof and reusable type and shall not deteriorate or loss their sealing properties thus permitting the entry of moisture. The bolts used for tightening shall be stainless steel only.

The voltage transformer tank shall be made of steel or stainless steel and thickness of tank shall not be less than 2 mm. The finishing coat shall be gray.

A primary neutral bushing with 3 kV short-duration power-frequency withstand voltage rated shall be provided at the tank cover. The 25 mm² copper cable shall be bonded between the primary neutral bushing and the tank's earth terminal. The cable shall be able to be disconnected for testing purpose.

The voltage transformer shall have ratings and characteristics as specified in **Table 2**.

Table 2
Ratings and characteristics of voltage transformer

Characteristics	Unit	Requirement	
		22 kV	33 kV
Highest system voltage	kV	24	36
Rated frequency	Hz	50	
Type	-	three-phase, pole-mounted, oil insulated, suitable for outdoor installation	
Vector group	-	YNyn0	
Rated primary voltage	V	$22,000/\sqrt{3}$	$33,000/\sqrt{3}$

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 6 of 21

Characteristics	Unit	Requirement	
		22 kV	33 kV
Rated secondary voltage			
- voltage signal for the FRTU	V	$110/\sqrt{3}$	
- power supply for the control unit	V	220	
Rated output *			
- voltage signal for the FRTU	-	not less than 40 VA, class 1	
- power supply for the control unit	-	not less than 500 VA, 10% voltage regulation at P.F. = 1.0	
Voltage factor	-	1.2 continuous and 1.9 at 30 seconds	
Insulation class of winding	-	class A (maximum temperature rise of 60 K)	
Rated power frequency withstand voltage, 1 minute.			
- primary winding	kV (r.m.s.)	50	70
- secondary winding	kV (r.m.s.)	3	3
Rated impulse withstand voltage at primary winding	kV (peak)	125	170
Minimum creepage distance of bushings, from live part to ground	mm	600	900
Total weight	kg	not more than 200	not more than 250

Note: * The total rated output of the voltage transformer shall be not more than 1 kVA.

Each set of the voltage transformer shall be provided with:

- (1) Solderless clamp type terminal connectors equipped on the HV terminals of the voltage transformer, suitable for aluminium conductor with diameter range of 9.0 – 12.6 mm (sizes 50 – 95 mm²)
- (2) Sealable secondary terminal box with connector with protective metal cap suitable for connecting to the control cabinet via control cable. The connector shall be 7-contact MIL-C-5015 male connector (plug) as shown in the enclosed **Drawing No. SB4-015/59004**.
- (3) Control cable with outdoor-rate connectors for connecting between connectors on the voltage transformer and on the bottom of the control cabinet, each 13 meter long. The control cable shall be 7 x 1.5 mm² cable according to TIS 838 type B. The connectors on both sides of the cable shall be 7-contact MIL-C-5015 female connectors (receptacle).
- (4) Earth terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm²)
- (5) Bird guard caps (bushing cover) made of ultra-violet resistant and tracking resistant material, e.g. polyethylene compound or rubber compound which is suitable for exposure to sunlight.



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 7 of 21

1c.6 Control unit

1c.6.1 Switch Power Supply (SPS)

Each set of the RCS shall be provided with a Switch Power Supply (SPS) for supplying AC/DC power to the operating mechanism, the local control panel, and the control cabinet heater.

In addition, the SPS shall supply 24 V DC power to the terminal blocks for the FRTU (provided by PEA) and shall supply 12 V DC power to the terminal blocks for the radio (provided by PEA).

For bidding purposes, the bidders shall assume that the FRTU and radio together will require approximately seventy-five (75) watts while the radio is in transmit mode and approximately thirty-five (35) watts while the radio is in receive mode.

Under normal condition, the SPS shall be powered from the primary circuit (22 kV or 33 kV) via the voltage transformer (in clause 1c.5). In case of AC power failure, the SPS shall provide DC power to the switches and associated equipment from a backup power supply system integrated in the SPS.

The SPS shall be also powered from 230 V AC external power supply and the terminal for connection shall be provided. A connecting cable, not less than 10 meter long, with suitable connectors for connecting between the external power supply from PEA's low voltage system (95 mm² aluminium cable) and the control cabinet via the 7-contact MIL-C-5015 male connector, as shown in **Drawing No. SB4-015/59003** and **SB4-015/59005**, shall be provided.

The backup power supply system shall be of maintenance free rechargeable battery pack.

The batteries shall have sufficient capacity to sustain operation of the equipment including FRTU and radio for not less than twelve (12) hours after the AC power supply is failed and shall be able to operate the switches with not less than two (2) open – close cycles.

For bidding purposes, the bidders shall assume that the DMS radio will be transmit mode for at least 20% of the time during this period. The batteries shall have a minimum lifetime of five (5) years at 25°C.

The battery voltage shall be 24 V DC and shall be of sealed lead acid or dry type.

The battery charger shall be fully temperature compensated and have the facilities input voltage between 220 V AC and 230 V AC.

To prevent deep discharge of the batteries on loss of AC power source, the battery charger shall automatically disconnect all circuitry fed by the batteries following a user-adjustable time period or when the battery voltage falls below a preset value. If the battery voltage discharged below the preset value, the time to fully recharge the whole batteries shall not exceed twenty-four (24) hours.

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 8 of 21

In order to prevent serious batteries discharging, the direct current power will be cut off when voltage stays under the minimum preset value (as specified on previous paragraph).

The automatic battery checking device shall be provided to check battery's health and initiate battery failed alarm signal in case of deterioration detected. The deterioration detecting could be the comparative method between the measurement values and setting values (i.e. internal resistance, voltage, etc.).

Each set of battery chargers shall be provided with at least the following alarms:

- Low battery voltage alarm
- High battery voltage alarm
- Battery failed alarm
- Battery charger overvoltage alarm
- Grounded battery or battery-charger alarm
- Others according to manufacturer's design

Each alarm indicators shall be displayed on the local control panel.

1c.6.2 Local control panel

The RCS shall be furnished with local swing type control panel for initiating control actions and viewing the status indicators of the switches. As minimum, the local control panel shall include the following:

- (1) Separate discrepancy switches for opening and closing the switches. Discrepancy switches operations of the switches shall be possible when the AC power supply is off using the backup power supply system.
- (2) A Remote/Local switch. While this switch is in the "Local" position, control shall be permitted only from the local control panel (i.e. remote control shall be prohibited). While the switch is in "Remote" position, control shall be permitted from either the DMS or the control panel.
- (3) Separate "Open" (green) and "Close" (red) status LED super bright pilot lamps or better for the Switches.
- (4) A "Gas Low Pressure" LED super bright pilot lamp or better, ONLY for SF₆ deadtank switches.
- (5) An operation counter to indicate the number of switching cycles of the switches. The operation counter shall count the increment for electrical operations (remote control or local control) and mechanical operations (hook-stick).
- (6) Others according to manufacturer's design.

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 9 of 21

1c.6.3 Distribution Management System (DMS) interface

The RCS shall have capabilities to be controlled and monitored by the telecommunication system of the DMS in the future.

The control unit of the RCS shall communicate with DMS via a Multiple Address Radio System (MARS) (provided by PEA) to the FRTU.

The control unit of the RCS shall have provisions for opening and closing the switches by using output from the FRTU. The control unit of the RCS shall also supply analog and status signals to the FRTU for monitoring the conditions of the primary circuit and the components of the RCS.

A typical list of the input/output points of the analog and status signals of the RCS shall be as stated in **Table 3** below:

Table 3
Analog and status signals of the Remote Controlled Switches

Item	Signal	Quantity per switch
Analog signals :		
Current – Phase A	0-1 A or 0-5 A	1
Current – Phase B	0-1 A or 0-5 A	1
Current – Phase C	0-1 A or 0-5 A	1
Voltage A-B	0-110 VAC	1
Voltage B-C	0-110 VAC	1
Voltage C-A	0-110 VAC	1
Status (discrete) signals :		
Switch Open	Dry Contact	1
Switch Close	Dry Contact	1
Switch Mechanical Lock	Dry Contact	1
Switch Mechanical Free	Dry Contact	1
Local Control Mode	Dry Contact	1
Remote Control Mode	Dry Contact	1
Low Battery Voltage	Dry Contact	1
High Battery Voltage	Dry Contact	1
Battery Failed Alarm	Dry Contact	1
Battery Charger overvoltage	Dry Contact	1
Ground Battery/Charger	Dry Contact	1
SF6 Gas Low Pressure Alarm	Dry Contact	1
SF6 Gas Low Pressure Lockout	Dry Contact	1
Cabinet Door Open	Dry Contact	1
External control signals:		
Open Switch	Dry Contact	1
Close Switch	Dry Contact	1

1c.6.4 Control cabinet

Each set of the RCS shall be equipped with a control cabinet that will houses the local control panel, SPS, FRTU, radio, and other equipment according to manufacturer's design; as shown in the enclosed **Drawing No. SA4-015/49002.**

All electronic parts shall be enclosed in modules which protects them from entry of small insects; and shall be separated from the power supply module.

The control cabinet shall be manufactured such that ingress of dust, vermins, and small objects is prohibited. The control cabinet shall have a minimum protection class of IP 54. The holes with a metal screen shall be provided on the top and bottom of the control cabinet for ventilation to avoid water and condensation inside. The control cabinet shall be tested in accordance with the latest IEC 60529. However venting shall in no way reduce the effectiveness of the control cabinet's water-tight, dust-tight, and corrosion-resistant characteristics.

The control cabinet shall have a hinged front access door with three-point latch locking system and latch operating lockable handle. The front of the cabinet (behind the door) shall have a perimeter flange and gasket (rubber or neoprene) to prevent water entering inside.

The control cabinet shall include a space for mounting the FRTU and radio. A minimum contiguous space of 430 mm (height) x 600 mm (width) x 150 mm (depth) shall be provided for this equipment. The outside dimensions of the control cabinet shall not exceed 940 mm (height) x 620 mm (width) x 300 mm (depth).

The control cabinet shall include a weather-sealed hole with cable gland, approximately 30 mm in diameter, on the bottom of the cabinet for routing an antenna cable.

The control cabinet shall be fabricated from sheet steel of not less than 2 mm in thickness.

The finishing coat shall be grey (RAL 7032).

The control cabinet shall be suitable for mounting on a prestressed concrete pole. There shall have a steel channel fixed to the back of the control cabinet for mounting purpose.

The control cabinet shall be provided with:

- (1) Hygrostat controlled heater
- (2) Weatherproof fittings for control cables
- (3) Provision for handle and padlock
- (4) Earth terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm²); complete with lock washer of stainless steel or better
- (5) Circuit diagram of control unit for maintenance purpose

- (6) Battery tray, made of acid-resistant material, suitable for supporting the battery and protection an adjacent equipment from the battery's electrolyte.
- (7) Others according to manufacturer's design.

1c.6.5 Electric surge protection

All necessary measures shall be taken to ensure proper functions and component safety of the local control panel, the SPS, and all other RCS components connect to wiring external to the control cabinet with respect to switching voltage transients and all regular atmospheric, electrical, and magnetic disturbances, whether induced or directly coupled.

In particular, the equipment shall be constructed and tested to meet the latest applicable standards of IEC 60255-5, or ANSI/IEEE C37.90.1 and ANSI/IEEE C37.1 and be capable of withstanding the tests described in these standards without damage, false control output, or loss of internally stored data and parameters.

The electric surge protection shall be separated from Print Circuit Board (PCB).

The electric surge protection for power supply shall be Surge Protective Device (SPD) and shall be installed as follows:

- Connected between Line and Neutral (L-N)
- Connected between Neutral and Ground (N-G)

The SPD shall have rating as the follows:

- Standard : IEC 61643-11
- Arrester class : class II
- Nominal voltage, U_n : 240 V AC
- Maximum continuous operating voltage, U_c (L-N) : 350 V AC
- Maximum continuous operating voltage, U_c (N-G) : 264 V AC
- Nominal discharge surge current, I_n (8/20 μ s) : 20 kA per phase
- Max discharge surge current, I_{max} (8/20 μ s) : 40 kA per phase
- Response time (L-N) : ≤ 25 ns
- Response time (N-G) : ≤ 100 ns
- Voltage protection level, U_p (L-N) : ≤ 1.5 kV
- Voltage protection level, U_p (N-G) : ≤ 1.5 kV
- Temperature range : -40°C to 70°C



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 12 of 21

1c.6.6 Terminal blocks

Terminal blocks shall be provided on the SPS for connecting power cables from the FRTU and the radio and for terminating all input and output signals as specified in **Table 3** of **1c.6.3** between the RCS and the FRTU. Terminal blocks shall be of bare wire compression type.

The terminal blocks shall be of heavy-duty, 600 V DC moulded block type with moulded insulating barrier between terminals. Each terminal block and individual terminal shall have removable white marking strip for marking circuit designation.

No more than two (2) wires shall be connected to any terminal. Adequate space and hardware shall be provided for routing of the field wiring within the control cabinet.

1c.7 Minimum nameplate information

- (1) Manufacturer's name/country
- (2) Type
- (3) Manufacturer's serial number
- (4) Year of manufacture
- (5) Rated voltage
- (6) Rated frequency
- (7) Rated normal current
- (8) Rated symmetrical interrupting current
- (9) Rated short-time withstand current, 1 sec
- (10) Rated short-circuit making current
- (11) Rated power frequency withstand voltage, 1 min
- (12) Rated impulse withstand voltage
- (13) Rated auxiliary voltage
- (14) Net weight

1c.8 Marking

PEA's code number and contract number shall be painted in orange on the switches, voltage transformer, control cabinet and export crate/wooden case. The code and contract number shall be easily visible from ground level. The code number and dimensions of each letter to be marked will be given by PEA after the final of bid consideration.

1d Tests and test reports

1d.1 Type tests

- (1) The switches shall be passed the type tests in accordance with IEC 60265-1: 1998 or later edition at least the following items:
 - (a) Dielectric tests
 - (b) Measurement of the resistance of the main circuits
 - (c) Temperature-rise tests
 - (d) Short-time withstand current and peak withstand current tests
 - (e) Verification of the protection
 - (f) Tightness tests
 - (g) Making and breaking tests
 - (h) Mechanical operation test
- (2) The voltage transformer shall be passed the type tests in accordance with the IEC 61869-3 : 2011 or later edition at least the following items:
 - (a) Temperature-rise test
 - (b) Short-circuit withstand capability test
 - (c) Impulse voltage withstand test on primary terminals
 - (d) Wet test for outdoor type transformer
 - (e) Test for accuracy¹⁾
 - (f) Partial discharge measurement
 - (g) Voltage transformer's tank pressure test²⁾

Note:

¹⁾ The test shall be done at 40 VA measuring winding.

²⁾ The tested pressure shall be not less than 14.5 psi (1 bar) from an atmospheric pressure for 1 minute. The tank of the voltage transformer shall withstand the pressure without permanent deformation and any leakage. PEA will also accept the voltage transformer's tank pressure test by the manufacturer.

All items of the type tests shall be conducted or inspected by the acknowledged independent testing laboratories.

The following independent testing laboratories accepted by PEA:

- DNV GL : Det Norske Veritas (former KEMA)
- V' Fall : Statens Vattenfallsverk, The Swedish State Power Board
- CRIEPI : Central Research Institute of Electric Power Industry
- EdF : Electricite de France
- CESI : Centro Elettrotecnico Sperimentale Italiano
- PLI : Powertech High Power Laboratory

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 14 of 21

- STRI : Swedish Transmission Research Institute
- TCA : Testing and Certification
- OHT : Ontario Hydro Technologies
- EGAT : The Electricity Generating Authority of Thailand
- : Testing Laboratory, Electrical Engineering Department, Faculty of Engineering,
Chulalongkorn University
- SATS : Scandinavian Association for Testing Electric Power Equipment
- Intertek : Intertek
- EEI : Electrical and Electronic Institute

PEA will also accept the switches and voltage transformer which are tested by the other independent testing laboratories not mentioned above, but the testing laboratories shall be accredited laboratories in accordance with ISO/IEC 17025 and the scope of the accreditation shall be covered the relevant test items, standards and equipment. Certification and scope of accreditation of the laboratories shall be submitted to PEA for consideration.

If the bidders or manufacturer prefer to do the type tests of the switches and voltage transformer with the laboratories or by the manufacturer himself without the qualification mentioned above, the detail of the test facilities of the laboratories or the manufacturer shall be submitted to PEA for approval before the tests are proceed and before the bid closing date. PEA reserves the right to send representatives to inspect and witness the tests with the cost of the bidders or manufacturer.

The type test reports shall contain all data required for their complete understanding such as; diagrams, methods, instruments, constraints and values in the tests and the results obtained.

The type test reports shall be submitted with the bid or within fifteen (15) calendar days after the bid closing date. The Switches and voltage transformer offered without submitting the type test reports shall be rejected.

The cost of all tests and report, including the tests and reports for acceptance inspection, shall be borne by the contractor.

1d.2 Routine tests

The RCS shall be passed the manufacturer's standard routine tests, and also passed of the routine tests in accordance with the relevant IEC standards at the manufacturer's laboratory as follows:

- (1) The switches and control unit shall be passed the routine tests in accordance with the IEC 60265-1: 1998 or later edition at least the following items:
 - (a) Power frequency voltage withstand dry tests on the main circuit
 - (b) Voltage withstand tests on auxiliary and control circuit



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 15 of 21

- (c) Measurement of the resistance of the main circuit
 - (d) Mechanical operation tests
 - (e) Tightness test
 - (f) Measurement of operating time
 - (g) Function test of control unit
- (2) The current sensors shall be passed the routine tests in accordance with the IEC 61869-2 : 2012 or later edition at least the following items:
- (a) Inter-turn overvoltage test
 - (b) Verification of terminal marking
 - (c) Test for accuracy
- (3) The voltage transformer shall be passed the routine tests in accordance with the IEC 61869-3: 2011 or later edition at least the following items:
- (a) Power frequency voltage withstand test on primary windings
 - (b) Power frequency withstand test between section and on secondary winding
 - (c) Partial discharge measurement
 - (d) Verification of terminal marking
 - (e) Test for accuracy

1d.3 Acceptance tests

PEA's acceptance committee will inspect and randomly sampling the RCS for testing. The number of the samples shall be not less than five (5) percent of the total number of the RCS according to the contract but not less than five (5) sets. All samples shall be passed the tests otherwise the contract will be rejected.

PEA reserves the right to test the samples by PEA's laboratory or independent laboratory or the manufacturer's laboratory.

The acceptance test items shall be as follows:

- (1) The switches and control unit shall have the acceptance test items same as all items of the routine test specified in clause **1d.2**.
- (2) The current sensors shall have the acceptance test items same as all items of the routine test specified in clause **1d.2** except the Inter-turn overvoltage test.
- (3) The voltage transformer shall have the acceptance test items same as all items of the routine test specified in clause **1d.2** with additional test item as follow:
 - (a) Temperature-rise test, the temperature –rise test will be done only one (1) sample for each contract.

The cost of the acceptance tests and reports shall be borne by the contractor.



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 16 of 21

1d.4 Manufacturing inspection

PEA reserves the right to send the representatives by PEA's expense to inspect material, equipment, process and tests during manufacturing, at any time he deems necessary. The contractor shall provide free access to the facilities where the equipment is being manufactured and shall satisfy the representatives that the material, equipment, process and tests are in accordance with this specification and the purchase contract.

1e Packing

Each set of the RCS with installation instruction and its accessories with part list shall be seaworthy packed in an export crates or wooden cases; but each set of accessories with part list may be separately seaworthy packed in other wooden cases to avoid damage during transportation.

Part belonging to different sets of the RCS shall not be packed in the same package.

If the package is made of rubber wood (Yang-para of *Hevea brasiliensis*), the wooden parts shall be treated with wood preservative.

Plastic foam shall not be accepted.



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 17 of 21

Invitation to Bid No. :

C2 Material and packing data shall be submitted with the bid

2a Design and performance data

2a.1 The switches

Item.....

Description	Unit	Data
1. Manufacture and country of origin	-	
2. Model/Type or catalogue No.	-	
3. Standard	-	
4. Rated nominal system voltage	kV	
5. Rated frequency	Hz	
6. Rated normal current	A	
7. Rated symmetrical interrupting current	A	
8. Rated short-time withstand current, 1-second	kA (r.m.s.)	
9. Rated short-circuit making current	kA (peak)	
10. Rated power frequency withstand voltage, 1-minute	kV (r.m.s.)	
11. Rated impulse withstand voltage	kV (peak)	
12. Rated mainly active load breaking capacity	A	
13. Rated transformer off-load breaking capacity	A	
14. Rated cable-charging breaking capacity	A	
15. Time to open, at rated nominal current	seconds	
16. Time to close	second	
17. Maximum temperature rise of		
- contacts	K	
- current carrying parts	K	
- mechanical parts	K	
18. Number of operations		
- mechanical	-	
- electrical (at rated normal current)	-	
19. Rated pressure range of SF ₆ gas	kgf/cm ³	
20. Pressure of SF ₆ when alarm and locking device operates	kgf/cm ²	
21. Protection degree of assembled enclosure	-	
22. Operation force of handle	kgf	
23. Conductor material of main circuit leads	-	



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 18 of 21

Invitation to Bid No. :

Item.....

Description	Unit	Data
24. Cross section area of main circuit lead	mm ²	
25. Creepage distance of bushing or supporting insulator, from live part to ground	mm	
26. Weight of each set of the switches (with operating mechanism)	kg	

2a.2 Current sensors

Item.....

Description	Unit	Data
1. Manufacture and country of origin	-	
2. Model/Type or catalogue No.	-	
3. Standard	-	
4. Rated primary current	A	
5. Rated secondary current	A	
6. Rated frequency	Hz	
7. Accuracy	-	
8. Power rating (burden)	VA	

2a.3 Voltage transformer

Item.....

Description	Unit	Data
1. Manufacture and country of origin	-	
2. Model/Type or catalogue No.	-	
3. Standard	-	
4. Highest system voltage	kV	
5. Rated frequency	Hz	
6. Type	-	
7. Vector group	-	
8. Rated primary voltage	V	
9. Rated secondary voltage		
- voltage signal for the FRTU	V	
- power supply for the control unit	V	



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 19 of 21

Invitation to Bid No. :

Item.....

Description	Unit	Data
10. Rated output		
- voltage signal for the FRTU	-	
- power supply for the control unit	-	
11. Voltage factor	-	
12. Insulation class of winding	-	
13. Rated power frequency withstand voltage, 1-minute		
- primary winding	kV (r.m.s.)	
- secondary winding	kV (r.m.s.)	
14. Rated impulse withstand voltage at primary winding	kV (peak)	
15. Creepage distance of bushing, from live part to ground	mm	
16. Total weight	kg	

2a.4 Battery charger

Item.....

Description	Unit	Data
1. Manufacture and country of origin	-	
2. Rated input voltage	V	
3. Rated output voltage DC	V	
4. Rated output current DC	A	
5. Rated frequency	Hz	
6. Rated capacity	VA	

2a.5 Battery

Item.....

Description	Unit	Data
1. Manufacture and country of origin	-	
2. Model/Type or catalogue No.	-	
3. Rated voltage DC	V	
4. Rated capacity	Ah	
5. Number of cells	-	
6. Operating voltage per cell	V	
7. Time to completely charge from total discharge	hr	

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 20 of 21

2b Catalogues and details of the RCS components

2c Drawings of the RCS components, such as switches, voltage transformer, control cabinet etc., with main dimensions in mm, showing of particulars of normal construction

2d Drawings of pole-mounting details, with main dimensions in mm, showing mounting position on concrete pole, mounting bracket and hardware, and accessories

2e Complete interlocking schematic of the RCS

2f Electrical wiring and connecting diagrams of operating circuits, control circuits, and DMS interface

2g List of spare parts with itemized prices

2h List of special tools with itemized prices

2i Packing details

Packing method (shown by drawing(s), and describe packing materials)

Type of storage facility required (indoor, outdoor)

Number of units, in each package

Dimensions (L x W x H) of each package in cm

Volume of each package in m³

Gross weight of each package in kg

Net weight of each package in kg

Number of packages

Notes: Conditions for documentation and consideration

1. The bidders have to submit (with the bid) the sufficient references describing the previous experience of the manufacture (e.g. list of supply of equipment and/or materials having the same or similar design as proposed, field experience, the registration of TISI, the copies of license, and/or the inspection to supplier's factory by PEA's inspectors, etc.) to the satisfaction of PEA.
2. The contractor has to supply documents, before shipment/delivery, to the following address:

Technical Specification Division

Engineering Department

Provincial Electricity Authority

200 Ngam Wong Wan Road, Chatuchak

Bangkok Metropolis 10900 Thailand



PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

REMOTE CONTROLLED SWITCHES FOR 22 kV AND 33 kV 50 Hz DISTRIBUTION SYSTEM

Specification No.: RPRO-014/2559

Approved date: 02/08/2559

Rev. No.: 2

Form No. 08-5.1

Page 21 of 21

as follows:

- 2.1 Reports of type test of the switches and voltage transformer
 - 2.2 Reports of routine test of the switches, current sensors and voltage transformer
 - 2.3 One (1) set of instruction book for installation, operation, and maintenance; and a test certificate which shall be packed together with each the RCS in **English and Thai**.
 - 2.4 Three (3) sets of instruction book and recommendation at which time interval the parts of RCS require attendance, which shall be sent to PEA within sixty (60) calendar days before the first shipment.
3. Delivery time is one of the important factors to be considered.

C3 Schedule of detailed requirement

Invitation to Bid No.: PEA-I(EB)-008/2563

Item	PEA. Material No.	Quantity	Description
1	1040073011	914 sets	Three-phase voltage transformer, outdoor type, for 22kV, 50Hz system voltage and accessories.
2	1040073012	86 sets	<p>Three-phase voltage transformer, outdoor type, for 33kV, 50Hz system voltage and accessories.</p> <p>ตามสเปคเลขที่ RPRO-014/2559 ข้อ 1C.5 Voltage Transformer มีรายละเอียดเพิ่มเติม ดังนี้.-</p> <p>Each set of voltage transformer shall be provided with:</p> <p>1) Solderless clamp type terminal connectors equipped on the HV terminals of the voltage transformer, suitable for aluminum conductor with diameter range of 9.0 – 12.6 mm (sizes 50 –95 mm²)</p> <p>(2) Sealable secondary terminal box with connector with protective metal cap suitable for connecting to the control cabinet via control cable. The connector shall be 7-contact MIL-C-5015 male connector (plug) as shown in the enclosed Drawing No. SB4-015/59004.</p> <p>(3) Control cable with outdoor-rate connectors for connecting between connectors on the voltage transformer and on the bottom of the control cabinet, each 13 meter long. The control cable shall be 7 x 1.5 mm² cable according to TIS 838 type B. The connectors on both sides of the cable shall be 7-contact MIL-C-5015 female connectors (receptacle).</p> <p>(4) Earth terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm²)</p> <p>(5) Bird guard caps (bushing cover) made of ultra-violet resistant and tracking resistant material, e.g. polyethylene compound or rubber compound which is suitable for exposure to sunlight.</p> <p><u>Accessories.</u></p> <p>Connector ตามมาตรฐาน MIL-C-5015 ชนิดตัวผู้ (Male) ขนาด 7 Contact เพิ่มเติม จำนวน 1 ชิ้นต่อชุด เพื่อใช้สำหรับติดตั้งกับตู้ควบคุม (Control Cabinet)</p>

C3 Schedule of detailed requirement

Invitation to Bid No.: PEA-I(EB)-008/2563

Item	PEA. Material No.	Quantity	Description
			<p>1. กำหนดส่งของ</p> <p>ผู้ขายจะต้องแจ้งกำหนดเวลาส่งมอบในแต่ละงวด ณ กองบำรุงรักษาระบบไฟฟ้า อาคาร 3 ชั้น 2 สำนักงานใหญ่ การไฟฟ้าส่วนภูมิภาค ในวันและเวลาทำการ ก่อนวันส่งมอบไม่น้อยกว่า 7 (เจ็ด) วันทำการ</p> <p>งวดที่ 1 ภายใน 120 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 400 ชุด</p> <p>รายการที่ 2 Voltage Transformer (VT) 33 kV จำนวน 86 ชุด</p> <p>งวดที่ 2 ภายใน 210 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 300 ชุด</p> <p>งวดที่ 3 ภายใน 300 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 214 ชุด</p> <p>2. การตรวจสอบกระบวนการผลิต</p> <p>กฟภ. ขอสงวนสิทธิ์ที่จะส่งเจ้าหน้าที่ของ กฟภ. หรือผู้แทนที่ได้รับการแต่งตั้งจาก กฟภ. เข้าไปตรวจสอบกระบวนการผลิตและการควบคุมคุณภาพระหว่างการผลิต ณ โรงงานผู้ผลิต ในแต่ละรายการของทุกงวดก่อนการส่งมอบของ ทั้งนี้จะต้องมีเอกสารแสดงการเข้าตรวจสอบของเจ้าหน้าที่ของ กฟภ. หรือผู้แทนฯ เพื่อใช้แนบประกอบการจ่ายเงิน</p> <p>3. ค่าปรับ</p> <p>ให้คิดค่าปรับเป็นรายวัน ในอัตราร้อยละ 0.20 ของราคาพัสดุ (รวมภาษีมูลค่าเพิ่ม) ที่ยังไม่ได้รับมอบ</p> <p>4. กำหนดยื่นราคา</p> <p>ผู้ยื่นประกวดราคาต้องยื่นราคาพัสดุเป็นจำนวน 90 วัน นับถัดจากวันที่เสนอราคา</p> <p>5. การรับประกันการชำรุดบกพร่อง</p> <p>- กำหนดรับประกันการชำรุดบกพร่องเป็นเวลา 5 ปี นับถัดจากวันที่ได้รับส่งมอบ</p> <p>- กรณีเกิดการชำรุดบกพร่อง หรือขัดข้องอันเนื่องมาจากการใช้งานตามปกติ ผู้ขายจะต้องมารับไปซ่อมแซมหรือแก้ไขสิ่งบกพร่องให้เสร็จสิ้น และส่งคืนให้แก่ผู้ซื้อหรือนำมาเปลี่ยนใหม่ โดยไม่คิดมูลค่า โดยต้องบริหารจัดการซ่อมแซมแก้ไขให้ใช้การได้ดีดังเดิมภายใน 30 วัน นับถัดจากวันที่ได้รับแจ้งความชำรุดบกพร่อง</p> <p>6. สถานที่ส่งของ</p> <p>กองบริหารและจัดการคลังพัสดุ 3 การไฟฟ้าส่วนภูมิภาค จ.ปทุมธานี</p>



PROVINCIAL ELECTRICITY AUTHORITY
TECHNICAL SPECIFICATION DIVISION

Specification No.: RPRO-014/2559 : Remote Controlled Switch For 22kV And 33kV 50Hz

Page 3 of 4

C3 Schedule of detailed requirement

Invitation to Bid No.: PEA-I(EB)-008/2563

Item	PEA. Material No.	Quantity	Description
			<p>7. หลักเกณฑ์การพิจารณาคัดเลือกข้อเสนอ</p> <p>“กฟภ. จะพิจารณาพัสดุที่ผลิตภายในประเทศเท่านั้น” และ</p> <p>“กฟภ. จะไม่พิจารณาจัดซื้อพัสดุจากผลิตภัณฑ์ที่อยู่ระหว่างกระบวนการปรับปรุงคุณภาพของ กฟภ. ” และ</p> <p>“กฟภ. จะไม่พิจารณาจัดซื้อพัสดุจากผลิตภัณฑ์ที่ยังอยู่ในระหว่างการแก้ไขปรับปรุงหรือทดสอบคุณภาพในกระบวนการตรวจรับของ กฟภ. ที่ทางคณะกรรมการตรวจรับพัสดุได้มีมติให้นำกลับไปแก้ไขปรับปรุงหรือทดสอบคุณภาพ”</p> <p>Note:</p> <p>1. Enclosed Drawings No. SA4-015/45003, No. SA4-015/49001, No. SA4-015/ 49002, No. SA4-015/ 49003, SB4-015/ 59001, SB4-015/ 59003, SB4015/59004 and SB4-015/59005; eleven (11) sheets.</p> <p>2. The bidders have to offer recommended spare parts, optional accessories, and special tools with a list of quantities and their itemized prices, if any; The prices of the spare parts, optional accessories and special tools shall not be taken into consideration for the purpose of the bid evaluation; and PEA reserves the right to purchase some or all of items, to adjust their quantities, or to cancel them.</p> <p>3. The bidders are at liberty to offer the Switches of vacuum type. The vacuum switch shall be equipped with a disconnecting switch in series with the vacuum interrupter. If three (3) phases of the vacuum interrupters are in the same enclosure, the insulation between earth and phase shall be SF gas.</p> <p>4. Qualification requirements</p> <p>4.1 The bidders have to offer the Switches of a type tested design from firms with at least five (5) years design and production experience with the proposed or similar Switches. The bidders have to demonstrate that at least 400 load-break switches of similar design to the proposed load-break switches have been in operation for a period of at least three (3) years.</p>

C3 Schedule of detailed requirement

Invitation to Bid No.: PEA-I(EB)-008/2563

Item	PEA. Material No.	Quantity	Description
			<p>4.2 The bidders may offer the Switches from firms having no experience before as mentioned in 4.1, such the Switches have to be manufactured under license and shall be passed the type tests which conducted at the acknowledged independent testing laboratory which located outside the country of the manufacturer. The Switches made by the licensee shall be marked with the original brand-names or trade-marks. The license shall be current license provided by firm having qualification as mentioned in 4.1.</p> <p>4.3 The bidders, who have never submitted the type test reports, have to submit the type test reports either prior to receipt of bids or within fifteen (15) calendar days of the bid closing date, for saving bid consideration time. The Item offered without submitting the type test reports shall be rejected.</p> <p>4.4 The Switches offered from firms having no qualifications as mentioned in 4.1 to 4.2 PEA reserves the right to purchase then of 20% or less.</p> <p>5. The Contractor has to guarantee the quality of each the Switches and their equipment as follows:</p> <p>5.1 Five (5) years from the date of issuance of the notice of acceptance for the Switches and their equipment (i.e. current sensors, voltage transformer, Switch Power Supply, local control panel, and control cabinet except battery)</p> <p>5.2 Two (2) years from the date of issuance of the notice of acceptance for the battery.</p>

Invitation to Bid No.:

Specification No.: RPRO-014/2559 : Remote Controlled Switch For 22kV And 33kV 50Hz

Manufacturer .:

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See detail & conditions attached)	Total Cost (See detail & conditions attached)
1	1040073011		Three-phase voltage transformer, outdoor type, for 22kV, 50Hz system voltage and accessories.	914 sets	<div>ให้เสนอราคาในระบบ</div> <div>e-GP</div>	
2	1040073012		<p>Three-phase voltage transformer, outdoor type, for 33kV, 50Hz system voltage and accessories.</p> <p>ตามสเปคเลขที่ RPRO-014/2559 ข้อ 1C.5 Voltage Transformer มีรายละเอียดเพิ่มเติม ดังนี้.-</p> <p>Each set of voltage transformer shall be provided with:</p> <p>1) Solderless clamp type terminal connectors equipped on the HV terminals of the voltage transformer, suitable for aluminium conductor with diameter range of 9.0 – 12.6 mm (sizes 50 –95 mm²)</p> <p>(2) Sealable secondary terminal box with connector with protective metal cap suitable for connecting to the control cabinet via control cable. The connector shall be 7-contact MIL-C-5015 male connector (plug) as shown in the enclosed Drawing No. SB4-015/59004.</p> <p>(3) Control cable with outdoor-rate connectors for connecting between connectors on the voltage transformer and on the bottom of the control cabinet, each 13 meter long. The control cable shall be 7 x 1.5 mm² cable according to TIS 838 type B. The connectors on both sides of the cable shall be 7-contact MIL-C-5015 female connectors (receptacle).</p>	86 sets		

Invitation to Bid No.:

Specification No.: RPRO-014/2559 : Remote Controlled Switch For 22kV And 33kV 50Hz

Manufacturer .:

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See detail & conditions attached)	Total Cost (See detail & conditions attached)
			<p>(4) Earth terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm²)</p> <p>(5) Bird guard caps (bushing cover) made of ultra-violet resistant and tracking resistant material, e.g. polyethylene compound or rubber compound which is suitable for exposure to sunlight.</p> <p><u>Accessories.</u></p> <p>Connector ตามมาตรฐาน MIL-C-5015 ชนิดตัวผู้ (Male) ขนาด 7 Contact เพิ่มเติม จำนวน 1 ชิ้นต่อชุด เพื่อใช้สำหรับติดตั้งกับตู้ควบคุม (Control Cabinet)</p> <p><u>หมายเหตุ</u></p> <p>1. กำหนดส่งของ</p> <p>ผู้ขายจะต้องแจ้งกำหนดเวลาส่งมอบในแต่ละงวด ณ กองบำรุงรักษาระบบไฟฟ้า อาคาร 3 ชั้น 2 สำนักงานใหญ่ การไฟฟ้าส่วนภูมิภาค ในวันและเวลาทำการ ก่อนวันส่งมอบไม่น้อยกว่า 7 (เจ็ด) วันทำการ</p> <p>งวดที่ 1 ภายใน 120 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 400 ชุด</p> <p>รายการที่ 2 Voltage Transformer (VT) 33 kV จำนวน 86 ชุด</p> <p>งวดที่ 2 ภายใน 210 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 300 ชุด</p> <p>งวดที่ 3 ภายใน 300 วัน นับถัดจากวันลงนามในสัญญา ประกอบด้วย</p> <p>รายการที่ 1 Voltage Transformer (VT) 22 kV จำนวน 214 ชุด</p>			

Invitation to Bid No.:

Specification No.: RPRO-014/2559 : Remote Controlled Switch For 22kV And 33kV 50Hz

Manufacturer .:

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See detail & conditions attached)	Total Cost (See detail & conditions attached)
			<p>2. การตรวจสอบกระบวนการผลิต กฟภ. ขอสงวนสิทธิ์ที่จะส่งเจ้าหน้าที่ของ กฟภ. หรือผู้แทนที่ได้รับการแต่งตั้งจาก กฟภ. เข้าไปตรวจสอบกระบวนการผลิตและการควบคุมคุณภาพระหว่างการผลิต ณ โรงงานผู้ผลิต ในแต่ละรายการของทุกงวดก่อนการส่งมอบของ ทั้งนี้จะต้องมีเอกสารแสดงการเข้าตรวจสอบของเจ้าหน้าที่ของ กฟภ. หรือผู้แทนฯ เพื่อใช้แนบประกอบการจ่ายเงิน</p> <p>3. ค่าปรับ ให้คิดค่าปรับเป็นรายวัน ในอัตราร้อยละ 0.20 ของราคาพัสดุ (รวมภาษีมูลค่าเพิ่ม) ที่ยังไม่ได้รับมอบ</p> <p>4. กำหนดยื่นราคา ผู้ยื่นประกวดราคาต้องยื่นราคาพัสดุเป็นจำนวน 90 วัน นับถัดจากวันที่เสนอราคา</p> <p>5. การรับประกันการชำรุดบกพร่อง - กำหนดรับประกันการชำรุดบกพร่องเป็นเวลา 5 ปี นับถัดจากวันที่ได้รับส่งมอบ - กรณีเกิดการชำรุดบกพร่อง หรือขัดข้องอันเนื่องมาจากการใช้งานตามปกติ ผู้ขายจะต้องมารับไปซ่อมแซมหรือแก้ไขสิ่งบกพร่องให้เสร็จสิ้น และส่งคืนให้แก่ผู้ซื้อหรือนำมาเปลี่ยนใหม่ โดยไม่คิดมูลค่า โดยต้องรีบจัดการซ่อมแซมแก้ไขให้ใช้การได้ดีดังเดิมภายใน 30 วัน นับถัดจากวันที่ได้รับแจ้งความชำรุดบกพร่อง</p> <p>6. สถานที่ส่งของ กองบริหารและจัดการคลังพัสดุ 3 การไฟฟ้าส่วนภูมิภาค จ.ปทุมธานี</p>			

Invitation to Bid No.:

Specification No.: RPRO-014/2559 : Remote Controlled Switch For 22kV And 33kV 50Hz

Manufacturer .:

Trade-mark :

Country of origin :

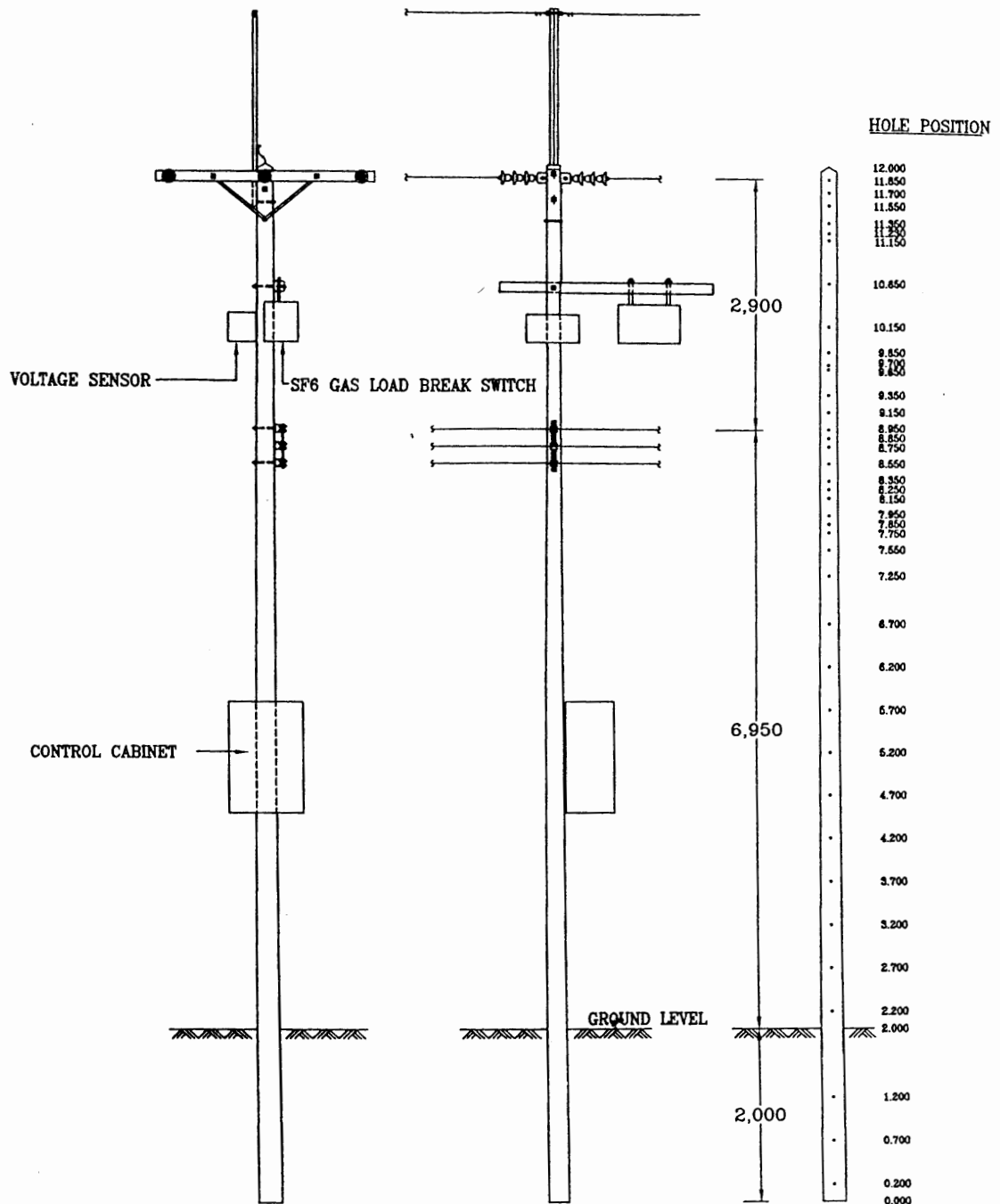
Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See detail & conditions attached)	Total Cost (See detail & conditions attached)
			7. หลักเกณฑ์การพิจารณาคัดเลือกข้อเสนอ “กฟภ. จะพิจารณาพัสดุที่ผลิตภายในประเทศเท่านั้น” และ “กฟภ. จะไม่พิจารณาจัดซื้อพัสดุจากผลิตภัณฑ์ที่อยู่ระหว่างกระบวนการปรับปรุง คุณภาพของ กฟภ. ” และ “กฟภ. จะไม่พิจารณาจัดซื้อพัสดุจากผลิตภัณฑ์ที่ยังอยู่ในระหว่างการแก้ไขปรับปรุงหรือ ทดสอบคุณภาพในกระบวนการตรวจรับของ กฟภ. ที่ทางคณะกรรมการตรวจรับพัสดุได้มีมติให้นำ กลับไปแก้ไขปรับปรุงหรือทดสอบคุณภาพ”			



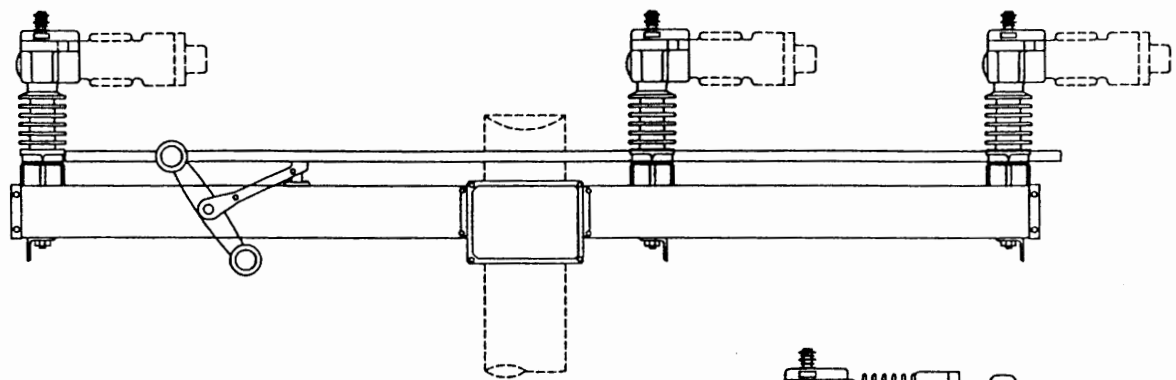
TYPICAL ARRANGEMENT

PRELIMINARY

NOTES :

1. VOLTAGE SENSOR HAVE TO INSTALLED ON THE SAME PEA CONCRETE POLES.
2. CONTROL CABINET SHALL BE SUITABLE FOR FIXING TO PEA CONCRETE POLE HAVING THE HOLE POSITION AS SHOWN.

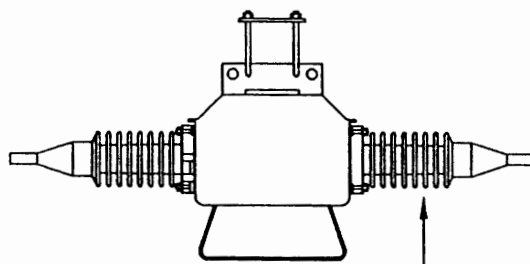
กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	<h3 style="margin: 0;">การไฟฟ้าส่วนภูมิภาค</h3>	ใช้แทนแบบ _____ ถูกแทนโดยแบบ _____ เขียนเสร็จวันที่ _____ แก้แบบวันที่ 27 ก.ค. 2549 มิติเป็น มิลลิเมตร มาตรฐาน _____ แบบเลขที่ SA4-015/45003 แผ่นที่ 1 ของจำนวน 1 แผ่น
ผู้เขียน จุมพล แก้วยิ้ม ผู้สำรวจ _____ วิศวกร <i>(Signature)</i> หัวหน้าแผนก _____ ผู้อำนวยการกอง _____ ผู้อำนวยการฝ่าย _____ รองผู้อำนวยการ <i>(Signature)</i>	ผู้ว่าการ <i>(Signature)</i> (กทพ)	
<h2 style="margin: 0;">REMOTE CONTROLLED SWITCHES INSTALLATION</h2>		



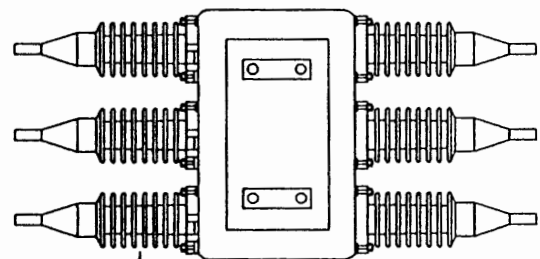
FRONT VIEW

SIDE VIEW

THIS STYLE/DESIGN SHALL NOT BE ACCEPTED.



SIDE VIEW



TOP VIEW

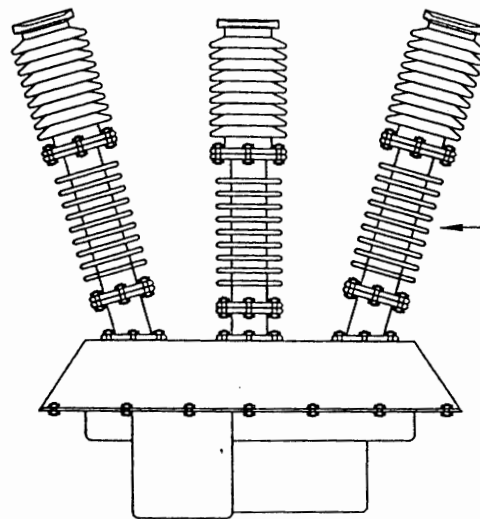
BUSHING

TYPICAL DESIGN

NOTE : THIS DRAWING IS ONLY GUIDING, NOT COMPELLING.

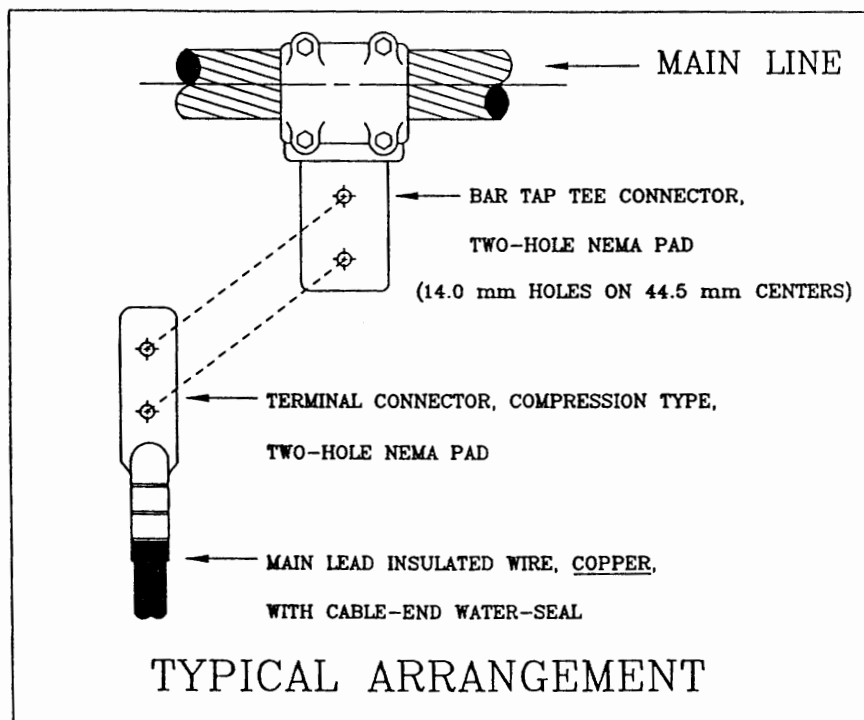
PRELIMINARY

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ SA2-015/39028
ผู้เขียน... จมพล แก้วมีม.....	ผู้ว่าการ... <i>[Signature]</i>	ถูกแทนโดยแบบ.....
ผู้สำรวจ.....		เขียนเสร็จวันที่ 24 พ.ค. 2549
วิศวกร... <i>[Signature]</i>		แก้แบบวันที่.....
หัวหน้าแผนก.....		มิติเป็น.....
ผู้อำนวยการกอง.....	THREE-PHASE SF6 GAS LOAD-BREAK SWITCH	มาตราส่วน.....
ผู้อำนวยการฝ่าย.....	TYPICAL DESIGN	แบบเลขที่ SA4-015/49001
รองผู้ว่าการ <i>[Signature]</i>		แผ่นที่ 1. ของจำนวน 2. แผ่น



SUPPORTING
INSULATOR

TYPICAL DESIGN

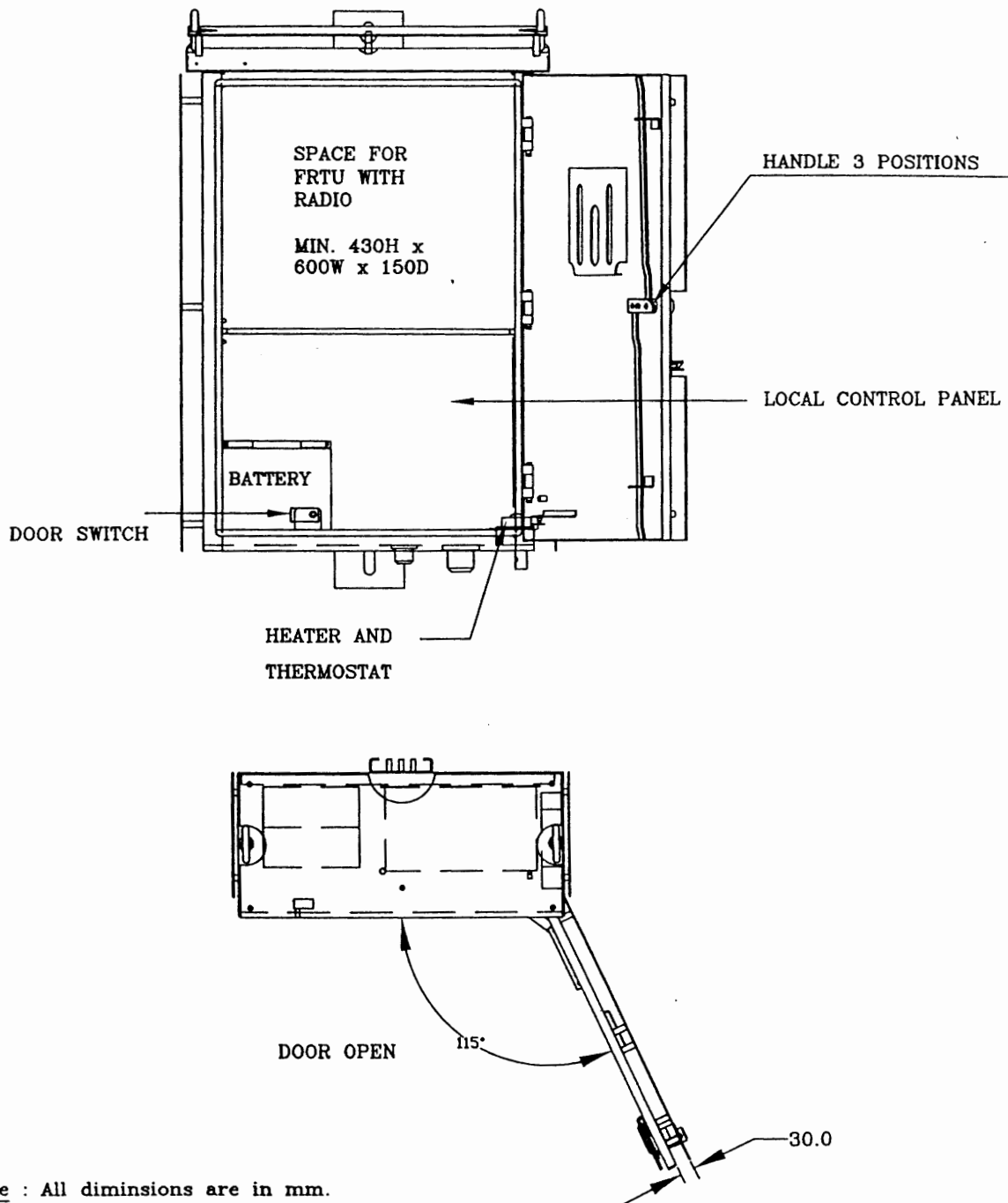


NOTE : THIS DRAWING IS ONLY GUIDING, NOT COMPELLING.

PRELIMINARY

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ SA2-Q15/39028 ถูกแทนโดยแบบ.....
ผู้เขียน... จุมพล แก้วยิ้ม..... ผู้สำรวจ..... วิศวกร..... หัวหน้าแผนก..... ผู้อำนวยการกอง..... ผู้อำนวยการฝ่าย.....	ผู้ว่าการ..... 14 08 (17/08)	เขียนเสร็จวันที่ 24 พ.ค. 2549 แก้แบบวันที่..... มิติเป็น..... มาตราส่วน.....
รองผู้ว่าการ	THREE-PHASE SF6 GAS LOAD-BREAK SWITCH TYPICAL DESIGN	แบบเลขที่ SA4-Q15/49001. แผ่นที่ 2. ของจำนวน 2. แผ่น

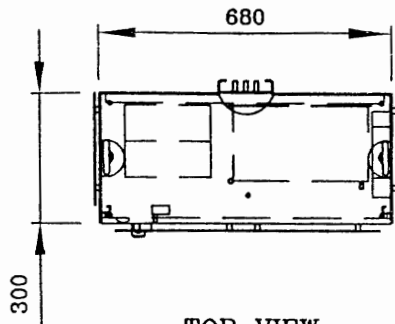
PRELIMINARY



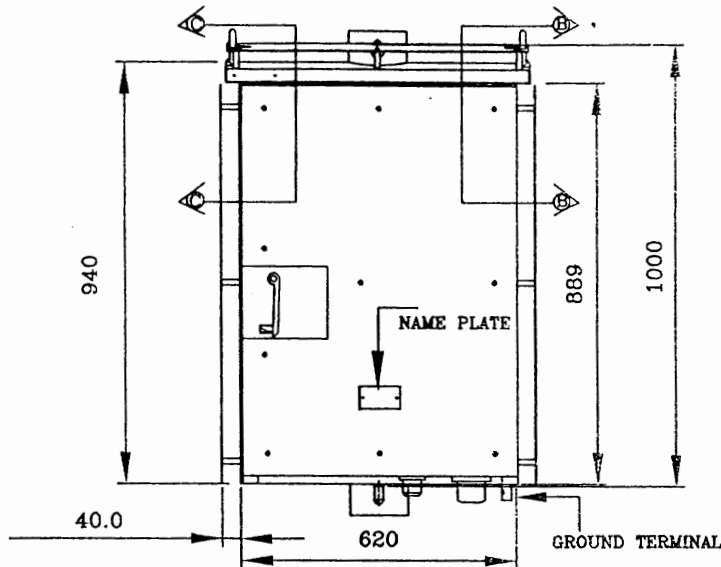
Note : All diminsions are in mm.

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้ตามแบบ
ผู้เขียน บัณฑิต เพ็ญดา	ผู้ว่าการ	ถูกแทนโดยแบบ
ผู้สำรวจ (นทช.)	เขียนเสร็จวันที่ 24. พ.ค. 2549
วิศวกร		แก้แบบวันที่
หัวหน้าแผนก		มิติเป็น
ผู้อำนวยการกอง	CONTROL CABINET OF REMOTE	มาตรฐาน
ผู้อำนวยการฝ่าย	CONTROLLED SWITCHES	แบบเลขที่ SA4-015/49002
รองผู้ว่าการฝ่ายงานระบบและระบบไฟฟ้า		แผ่นที่ 1 ของจำนวน 3 แผ่น

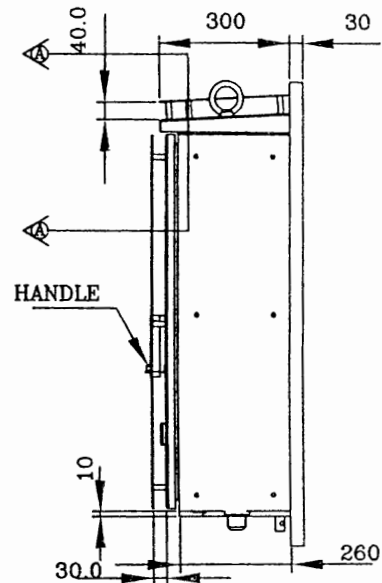
PRELIMINARY



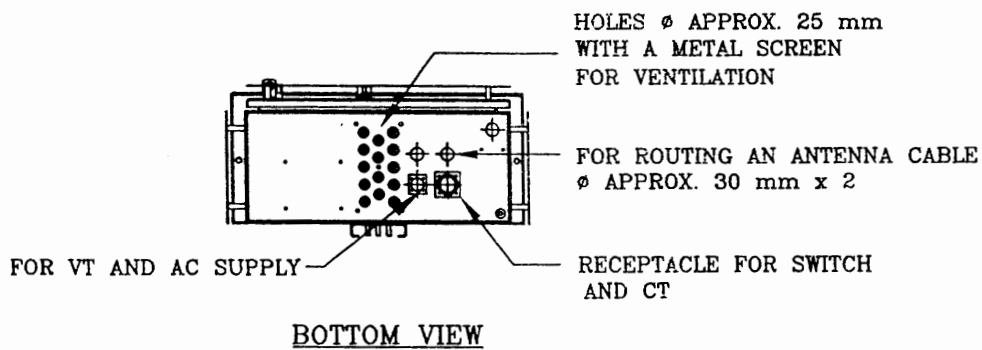
TOP VIEW



FRONT VIEW



SIDE VIEW



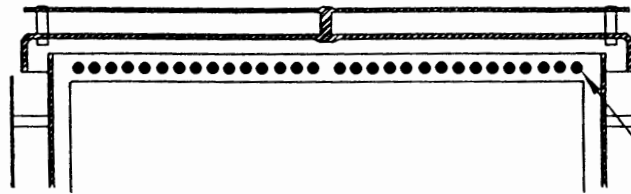
BOTTOM VIEW

Note : All diminsions are in mm.

: Dimension in tolerance $\pm 10\%$

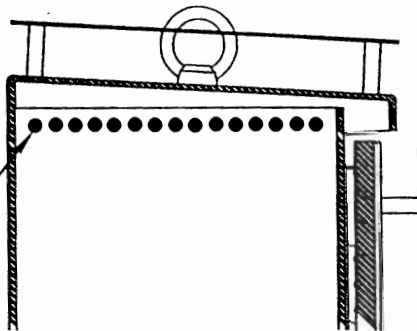
กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ
ผู้เขียน บัณฑิต เพ็ญดา	ผู้ตรวจการ <i>สม ภูมิ</i>	กำหนดโดยแบบ
ผู้สำรวจ <i>สม ภูมิ</i>	<i>(10/7/7)</i>	เขียนเสร็จวันที่ 24 พ.ค. 2549
วิศวกร <i>สม ภูมิ</i>		นำแบบวันที่
หัวหน้าแผนก		มีมติเป็น
ผู้อำนวยการกอง	CONTROL CABINET OF REMOTE	มาตรฐาน
ผู้อำนวยการฝ่าย	CONTROLLED SWITCHES	แบบเลขที่ SA4-015/49002
รองผู้อำนวยการแผนกและฝ่ายระบบไฟฟ้า		แผ่นที่ 2 ของจำนวน 3 แผ่น

PRELIMINARY



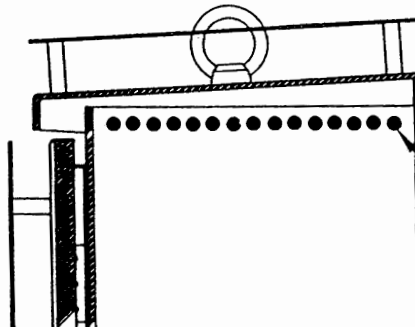
SECTION A-A

HOLES ϕ APPROX. 10 mm
WITH A METAL SCREEN
FOR VENTILATION



HOLES ϕ APPROX. 10 mm
WITH A METAL SCREEN
FOR VENTILATION

SECTION B-B



HOLES ϕ APPROX. 10 mm
WITH A METAL SCREEN
FOR VENTILATION

SECTION C-C

กองมาตรฐานระบบไฟฟ้า
ฝ่ายมาตรฐานและความปลอดภัย

การไฟฟ้าส่วนภูมิภาค

ใช้ตามแบบ

ถูกแทนโดยแบบ

ผู้เขียน .. บัณฑิต เพ็ญตา

ผู้ตรวจการ .. *Sam Kiat*

เขียนเสร็จวันที่ 24 พ.ค. 2549

ผู้สำรวจ

วิศวกร .. *Sam Kiat*

แก้แบบวันที่

หัวหน้าแผนก .. *Sam Kiat*

CONTROL CABINET OF REMOTE

มิติเป็น

ผู้อำนวยการกอง .. *Sam Kiat*

มาตรฐาน

ผู้อำนวยการฝ่าย .. *Sam Kiat*

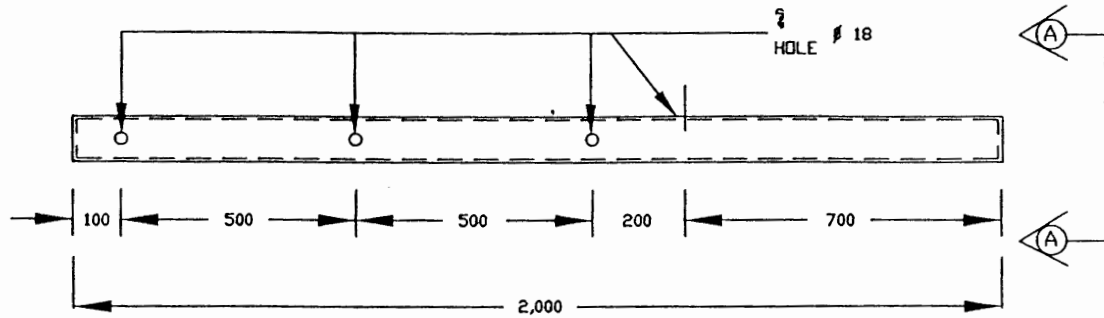
CONTROLLED SWITCHES

แบบเลขที่ SA4-015/49002

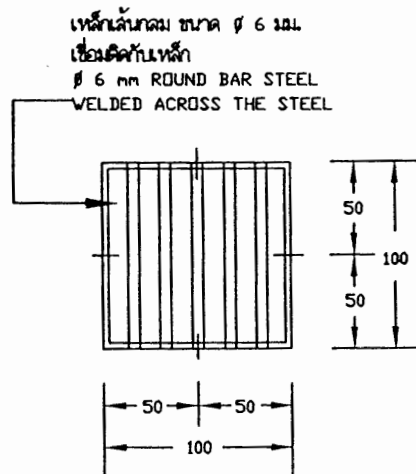
รองวิศวกรฝ่ายแผนและพัฒนาระบบไฟฟ้า .. *Sam Kiat*

แผ่นที่ 3 ของจำนวน 3 แผ่น

PRELIMINARY

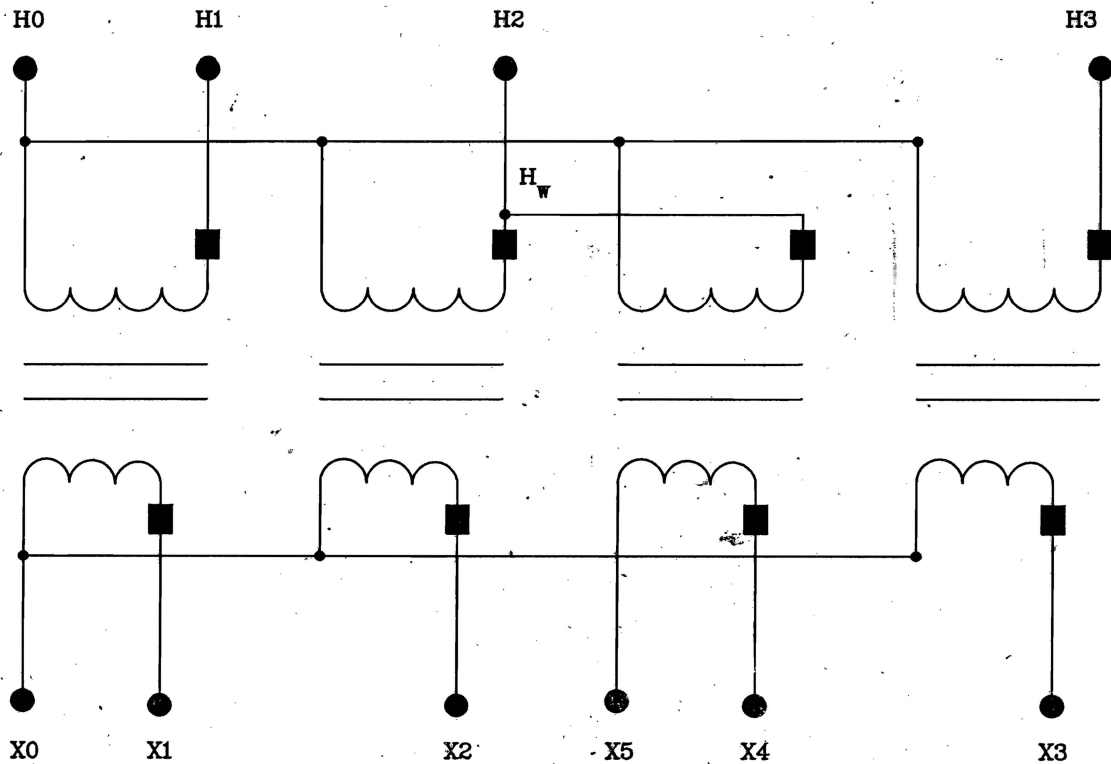


เหล็กฉากสี่เหลี่ยมจัตุรัส ขนาด 100x100x3.2 มม. ยาว 2,000 มม.
STEEL, SQUARE, 100x100x3.2 mm, 2,000 mm LONG



รูปตัด
SECTION A - A

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้ตามแบบ
ผู้เขียน บัณฑิต เพ็ญดา	ผู้ว่าการ	กำหนดโดยแบบ
ผู้สำรวจ	14 11 9 (พทพ)	เขียนเสร็จวันที่ 5 ก.ค. 2549
วิศวกร	CROSSARM, STEEL SQUARE TUBE	แก้แบบวันที่
หัวหน้าแผนก		ชนิดเป็น
ผู้ควบคุมการก่อสร้าง		มาตรฐาน
ผู้ควบคุมการช่าง		แบบเลขที่ SA4-015/49003
รองผู้ว่าการแผนกมาตรฐานและวิศวกรรมไฟฟ้า		แผ่นที่ 1 ของจำนวน 1 แผ่น



$H0-H1, H0-H2, H0-H3 = 22,000/\sqrt{3} \text{ V. or } 33,000/\sqrt{3} \text{ V.}$
 $X0-X1, X0-X2, X0-X3 = 110/\sqrt{3} \text{ V.}$
 $X4-X5 = 220 \text{ V.}$

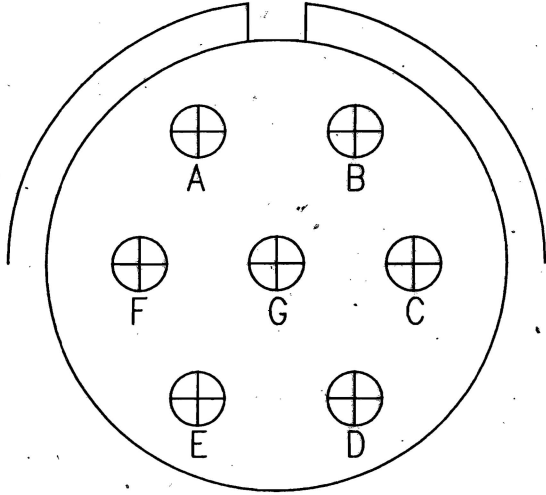
Note : - The winding power supply (H_w) can connect either H1, H2 or H3.
 - This winding diagram is the preliminary only.

กองข้อกำหนดทางเทคนิคฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ ถูกแทนโดยแบบ เขียนเสร็จวันที่ : 2 3 9 59 แก้แบบวันที่ มีดเป็น มาตรฐาน แบบเลขที่ SB4-015/59001 แผ่นที่ 1 ของจำนวน 1. แผ่น
ผู้เขียน ลิทธิพงษ์ ผู้สำรวจ วิศวกร หัวหน้าแผนก ผู้อำนวยการกอง ผู้อำนวยการฝ่าย	แผนผังการเชื่อมต่อวงจรไฟฟ้า และขนาดแรงดันไฟฟ้าของหม้อแปลงแรงดัน CONNECTION CIRCUIT DIAGRAM AND VOLTAGE RATINGS OF VOLTAGE TRANSFORMER	

CONTACT LEDEND



CONTACT SIZE # 12 A.W.G.



CONNECTORS STYLE	MIL-C-5015
SHELL SIZE	24-2
SERVICE RATING	D

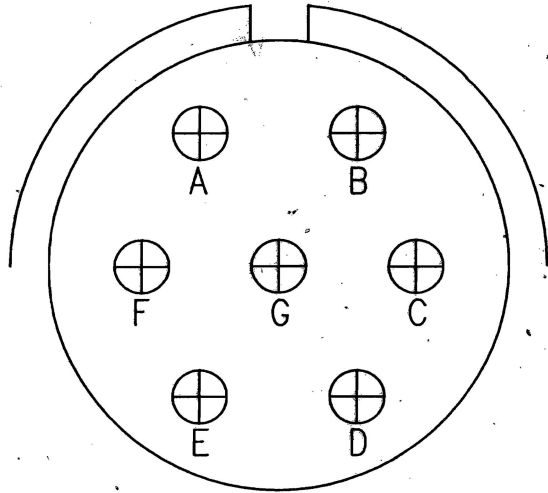
PIN	DESCRIPTION
A	SPARE
B	SPARE
C	SPARE
D	VOLTAGE - 230 V
E	NEUTRAL
F	SPARE
G	SPARE

กองข้อกำหนดทางเทคนิค ฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ ถูกแทนโดยแบบ
ผู้เขียน ลิทธิพงษ์ ผู้สำรวจ วิศวกร หัวหน้าแผนก ผู้อำนวยการกอง ผู้อำนวยการฝ่าย	CONTACT RECEPTACLE ARRAY OF 230 VAC EXTERNAL POWER SUPPLY	เขียนเสร็จวันที่ 20. 7569 แก้มแบบวันที่ ผลิตเป็น มาตรฐาน แบบเลขที่ SB4-015/59003 แผ่นที่ 1. ของจำนวน 1. แผ่น

CONTACT LEDEND



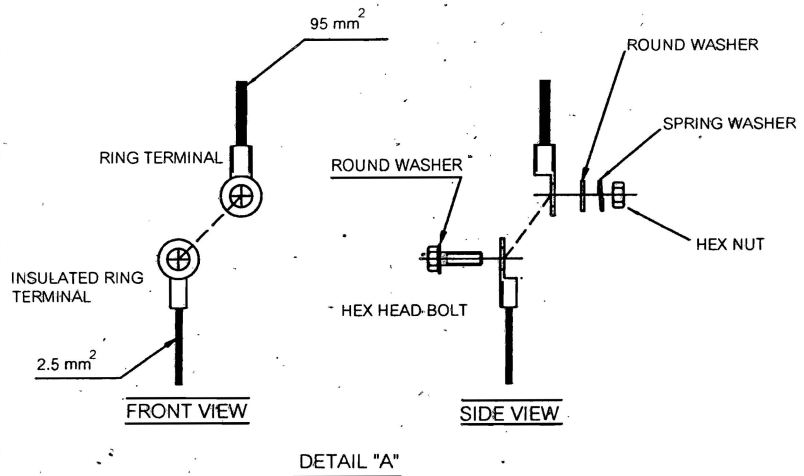
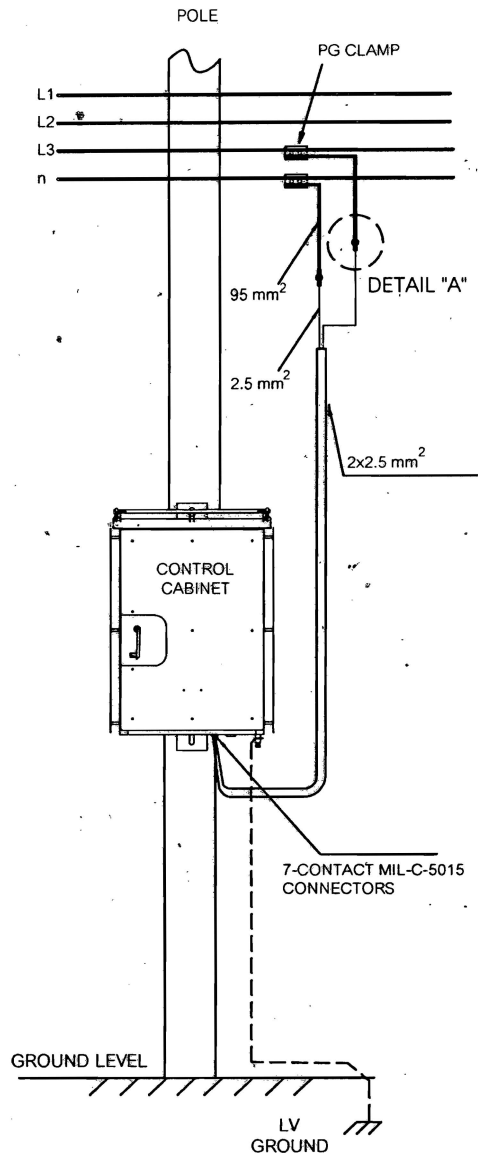
CONTACT SIZE # 12 A.W.G.



CONNECTORS STYLE	MIL-C-5015
SHELL SIZE	24-2
SERVICE RATING	D

PIN	DESCRIPTION
A	VOLTAGE, SIGNAL - PHASE A (X1)
B	VOLTAGE SIGNAL - PHASE B (X2)
C	VOLTAGE SIGNAL - PHASE C (X3)
D	POWER SUPPLY - 220 V (X4)
E	NEUTRAL OF POWER SUPPLY (X5)
F	SPARE
G	NEUTRAL OF VOLTAGE SIGNAL (X0)

กองข้อกำหนดทางเทคนิค ฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้ตามแบบ ถูกแทนโดยแบบ
ผู้เขียน ลิทธิพงษ์ ผู้สำรวจ วิศวกร หัวหน้าแผนก ผู้อำนวยการ ผู้อำนวยการฝ่าย	การจัดเรียงตำแหน่งคอนแทคของเต้ารับ ชนิดเจ็ดคอนแทคของหม้อแปลงแรงดัน 7-CONTACT RECEPTACLE ARRAY OF VOLTAGE TRANSFORMER	เขียนเสร็จวันที่ 7 2 2559 แก้แบบวันที่ ผลิตเป็น มาตรฐาน แบบเลขที่ SB4-015/59004 แผ่นที่ 1. ของจำนวน 1. แผ่น



EACH SET OF THE 230 V AC EXTERNAL POWER SUPPLY SHALL BE PROVIDED WITH :

1. TWO (2) SETS OF PG CLAMP, LENGTH NOT LESS THAN 55 mm IN LENGTH, FOR ELECTRICAL TAP OFF CONNECTION OF 95 mm² ALUMINIUM CONDUCTOR TO 95 mm² ALUMINIUM CONDUCTOR.
2. TWO (2) SETS OF 95 mm² LOW VOLTAGE ALUMINIUM CABLE, NOT LESS THAN 1 METER LONG/CABLE.
3. THE CONNECTING CABLE SHALL BE 2x2.5 mm² COPPER CONDUCTOR, ACCORDING TO TIS 11 TYPE 60227 IEC53, NOT LESS THAN 10 METER LONG.
4. TWO (2) SETS OF RING TERMINAL FOR 95 mm² LOW VOLTAGE ALUMINIUM CABLE.
5. TWO (2) SETS OF INSULATED RING TERMINAL FOR 2.5 mm² COPPER CONDUCTOR.
6. HEX HEAD BOLT WITH TWO SETS OF ROUND WASHER, SPRING WASHER AND HEX NUT.

กองข้อกำหนดทางเทคนิค ฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แบบ ถูกแทนโดยแบบ เขียนเสร็จวันที่ 22.2.2567 แก้แบบวันที่ มิติเป็น มาตรฐาน แบบเลขที่ SB4-015/59005 แผ่นที่ 1 ของจำนวน 1. แผ่น
ผู้เขียน สิทธิพงษ์ ผู้สำรวจ วิศวกร กฟ. 01/1 หัวหน้าแผนก ผู้อำนวยการกอง ผู้อำนวยการฝ่าย	INSTALLATION 230 V AC EXTERNAL POWER SUPPLY FOR REMOTE CONTROLLED SWITCHES	